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TITLE OF INVESTIGATION: Mapping islands, reefs and shoals in the oceans surrounding Australia.

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II. Techniques

The one new technique which has been developed since the last report is due to a further development of the LANDSAT data digital analysis system, at the Australian National University, which has been mentioned in previous Reports. Profiles of image densities, along the LANDSAT scene mirror scan lines, can be abstracted from the computer compatible tape form of the image. This capability is now being utilized in a comparison of image densities with water depths, as part of the investigation of techniques for abstracting water depths from the LANDSAT M.S.S. imagery. The profiling has been deliberately restricted to scan lines in order to eliminate those intensity variations which are due to variations in the detector's sensitivities.

III. Accomplishments

Techniques which were designed to improve the methods of undertaking geometric distortion tests, and which were mentioned in item II(iii) of the second Quarterly Report, have been implemented. A geometric distortion test was undertaken using the digital analysis system mentioned in the previous section. The co-ordinates of ground-control-points were measured (using the TV-monitor display of the LANDSAT imagery) in terms of the image co-ordinate system, i.e. in terms of scan line numbers and pixel numbers. The test, for which results are discussed in Section IV, confirmed that advantages resulted from using the University's tape-manipulating system.

IV. Significant Results

The geometric accuracy test which was mentioned in Section III, produced an estimate that the distortion levels on LANDSAT imagery are such that few corrections, or possibly no corrections, would be necessary in order to have the imagery satisfy the accuracy specifications of the Division of National Mapping. Furthermore, these results were achieved in a test in which other techniques which have been recommended for ground control point identification could not be applied; it would be expected that the measured distortion levels would be even further reduced when all the recommended techniques have been applied. That is, the apparent distortion which have been measured in the latest test include an error due to imperfect ground control point identification. Thus it can now be expected that the geometric accuracy of the low generation imagery, which is now being used in the geometric distortion tests, is such that the distortions would cause no difficulty during the course of map preparation.

V. Publications

Nil.

VI. Problems

- i) A proposal, which was outlined in the Second Quarterly Report, whereby the Hydrographic Service of the Royal Australian Navy were to obtain co-ordinates of ground control points in the Great Barrier Reef, was unsuccessful. (The plan was for the Hydrographic Service to survey 20 preselected points in an area of the Great Barrier Reef, off the north eastern Australian coastline, so that a LANDSAT scene of the area could be developed into a usable

map, utilizing techniques which have been developed during the investigation). The Hydrographic Service's survey was disrupted by a series of three tropical cyclones; only six of the proposed 20 points were ultimately co-ordinated. The Hydrographic Service has only recently departed from this region, but it is not expected that the Navy will be able to return to this area in 1976. This failure has severely disrupted the plan of the investigation. An alternative method of testing the mapping techniques is being sought, but it appears that it will not be possible to fully develop the map-making techniques in the way that had been originally planned. The distortion testing procedure may have to be accepted as satisfactory until another survey of ground control points can be arranged.

- ii) The computer compatible tape of a LANDSAT M.S.S. scene of portion of the Great Barrier Reef which was requested from EROS Data Centre has not yet been received in Australia. In fact, no other LANDSAT-2 CCT's are available in Australia for our use, so all aspects of the investigation which have involved CCT's are being undertaken on LANDSAT-1 tapes until LANDSAT-2 data is available.

VII. Data Quality and Delivery

The supply of 70 mm monochromatic transparencies ceased before the compilation of the Second Quarterly Report.

A CCT which was ordered in December has not yet been received, so that it is not yet possible to comment on the suitability of this form of imagery. However, LANDSAT-1 tapes have proved to be a satisfactory, and presumably equivalent, substitute.

VIII. Recommendations

In the previous report, it was proposed that the emphasis of the investigation should be placed on the attempt to prepare geometrically accurate maps from the LANDSAT imagery. The failure of the Hydrographic Service's attempt to obtain ground control in the proposed test area has disrupted this plan. The first priority for attention has reverted to the methods of determining water depths, a problem area which is expected to be more complex than the production of geometrically accurate maps. However, the priority orders must be viewed in the light of an overall plan. It has been concluded previously that the LANDSAT M.S.S. products, even in elementary form, can be valuably utilized by the Division of National Mapping for offshore mapping purposes. Although the water depth determination is now the highest priority task, attention must be given to all aspects of the investigation programme, in order to develop the use of the LANDSAT imagery to its maximum value before the end of the investigation period.

IX. Conclusions

- i) The achievements which it was hoped could be reported at this time have been made impossible by the problems described in Section VI.

- ii) Progress is being made in the development of techniques for abstracting water depths from the M.S.S. data.
- iii) The value of the imagery for offshore mapping purposes has been recognised; a usable form of the LANDSAT data must be finalized by the time that this investigation is to be finally reported.